

## Technical Memorandum

**Date:** February 9, 2021

**Project:** Beaverton Cooper Mountain Utility Plan (20-2755)

**To:** Sheila Sahu, PE  
City of Beaverton

**From:** Claire DeVoe, PE  
Murraysmith

**Reviewed By:** Heidi Springer, PE  
Murraysmith

**Re:** Potable and Non-Potable Water Alternatives Development

---

### Introduction

In December 2018, the regional government Metro approved the City of Beaverton (City) proposal to include Cooper Mountain in the Portland metro area Urban Growth Boundary (UGB). As part of the approval, comprehensive planning for the Cooper Mountain area was conducted in consideration of future land uses, natural resource protection, and utilities. The Cooper Mountain Utility Plan (CMUP) team completed comprehensive utility planning in support of the Cooper Mountain Community Plan (Community Plan). The purpose of this memorandum is to identify water and non-potable system alternatives for the Cooper Mountain area and provide a framework for future analyses.

### Level of Detail for Alternative Development

The alternative development documented herein is a high-level analysis intended to identify key considerations and opportunities in planning for water and non-potable utility service in Cooper Mountain. Proposed alternatives are based on existing City water and non-potable infrastructure and the best planning information available in coordination with the Community Plan. Proposed distribution piping for both potable and non-potable systems focuses on large-diameter “backbone” piping along four proposed roadway alignments. Although local distribution piping will be necessary to serve all customers and to provide system looping, limited information is currently available to define a more detailed neighborhood utility grid. It is anticipated that this more detailed utility plan will continue to fill in as specific developments and associated local roadways

have been identified. Distribution system looping through some of these future developments may impact the sizing and alignments of those currently proposed.

Projected future water system demands were analyzed at a high-level as well. Potable demands developed in the City Water System Master Plan (WSMP, Murraysmith, 2019) were assumed to be evenly distributed across pressure zones in the Cooper Mountain area. Non-potable demands were not evaluated at this conceptual phase of the CMUP project. Potable water pipes will be sized primarily to convey required fire flows while non-potable piping will be designed to supply peak irrigation demands. Proposed pipe sizes will need to be evaluated, for both potable and non-potable distribution, as specific developments and associated local roadways are identified.

## Design Criteria

The potable and non-potable water systems must provide adequate pressure at customer connections. Both distribution systems are divided into various pressure zones, based on ground elevation, to meet these service pressure requirements. Each pressure zone provides water at a specific hydraulic grade line (HGL) measured in feet elevation. The HGL is set by either a finished water storage reservoir overflow elevation, a pressure reducing valve (PRV) pressure setting, or a constant pressure pump station discharge head. Pressure requirements are slightly different for the potable and non-potable systems, which leads to slight differences in the pressure zone boundaries (see **Table 1**).

High-level assumptions for development of potable and non-potable alignments were documented in the Vision Statement and Guiding Principles memorandum (Murraysmith, 2020). This work is consistent with planning efforts described in the WSMP and the concurrent South Cooper Mountain (SCM) Non-Potable System planning by Murraysmith and GSI Water Solutions (GSI). Key criteria for both utilities are summarized in **Table 1**.

**Table 1**  
**Criteria for Potable and Non-Potable Systems**

Criteria	Potable	Non-Potable
Adequate Pressure Range	50-95 PSI (up to 125 PSI acceptable with individual service PRVs)  20 PSI minimum under Fire Flow + MDD	45-85 PSI
Maximum Flows	Fire Flow during PDD (1,000 – 3,000 gpm fire flow)	Peak Hour Irrigation
Acceptable Flow Velocities	< 10 fps during fire flow	no established criteria

1. Abbreviations: PSI = pounds per square inch (pressure), PRV = pressure reducing valve, PDD = peak day demand, fps = feet per second (flow velocity), gpm = gallons per minute (flow volume)

## Proposed Alignments

As discussed earlier in this memo, proposed alignments for both potable and non-potable are for a backbone distribution system only. Additional distribution pipelines will be required to supply all anticipated customers.

### Potable Water System

Potable water in the CMUP area will be served through an expansion of existing pressure zones, pump stations, and PRVs (see attached **Figure 1**). Storage will be provided by a proposed 550 Zone reservoir near SCM, known as Cooper Mountain Reservoir 3 (CMR 3), and the existing 794 Zone Cooper Mountain Reservoirs (CMR) 1 and 2 on Kemmer Road at the northern boundary of the CMUP project area. The distribution system will be an extension of existing zones, where possible, in both the SCM area (470, 550, and 675 Zones) and the western edge of the current Beaverton water service area (675 and 794 Zones).

### *Willamette Supply to 550 Zone*

Water will be pumped directly from the future Willamette Water Supply System (WWSS) into the proposed CMR 3 (550 Zone) through a transmission main from the proposed WWSS connection at the Tile Flat Pump Station, located near the intersection of Tile Flat Road and Barrows Road in SCM. After cycling through the CMR 3, water will flow through 550 Zone distribution piping, both new and existing within SCM. This 550 supply will also serve the 470 and 410 Zones in SCM through PRVs.

## *550 Zone to 794 CMR 1 and 2*

A proposed 794 HGL pump station at the proposed CMR 3 site will draw suction supply from CMR 3 and fill CMR 1 and 2, with an overflow elevation of 794 feet, as a secondary supply through the 24-inch 175th Avenue transmission main. Several distribution routing alternatives exist for connecting the proposed 794 pump station discharge to the 24-inch 175th transmission main. Two alternative routes are shown in the attached **Figure 1**. Final alignments will be determined by development timing along these corridors and potential utility crowding. Piping will be available to bypass CMR 3 when pumping up to CMR 1 and 2 and to fill CMR 3 from 550 Zone distribution, to maximize operational alternatives.

## *CMR 1 and 2 to Upper Zones*

From CMR 1 and 2, a constant pressure pump station, the Upper Pressure Zone Booster Pump Station (UPZ BPS), will serve the future 920 Zone. Like existing Beaverton operations, water pressure will then be reduced via a series of PRVs on the east side of Cooper Mountain Nature Park to serve future 920 and 860 Zone and connect with zones down to 550. Upper elevations on the west side of Cooper Mountain Nature Park will be served via a 675 Zone transmission main that crosses McKernan Creek and continues north up the side of Cooper Mountain, with intermediate elevations served by PRV. An alternative to this would be to extend a 794 HGL water line west from CMR 1 and 2, along SW Kemmer Rd to SW 190<sup>th</sup> Ave, and then south through subdivisions outside City limits to reach the 675 Zone near SW Grabhorn Rd. This route could be beneficial if City service area expands to the north in the future, as it may improve fire flow availability. However, it may be cost prohibitive due to the small number of customers, length of pipe, and potential roadway improvement costs from Washington County.

## *Non-Potable System*

### *Supply Source*

The non-potable supply for the CMUP project area is anticipated to be Aquifer Storage and Recovery (ASR) wells. Regulatory review and City decision making processes are still underway, including whether City Council will approve expanding the non-potable infrastructure to all of Cooper Mountain and to determine if non-potable ASR wells in the City's system will be recharged using treated stormwater or potable water. These processes are outside of the scope of this analysis and will not be addressed in this memo. If the City decides to pursue ASR recharge with treated stormwater, additional coordination with CMUP stormwater planning will be required. The City could use its existing Joint Water Commission (JWC) ASR limited license and/or the joint City/Tualatin Valley Water District (TVWD) limited license to allow for additional ASR wells in various locations on Cooper Mountain. Feasible ASR wells could be sited anywhere within Cooper Mountain using either limited license.

## *Distribution*

Non-potable water in the CMUP project area will be served through an expansion of the non-potable water system in SCM. The SCM non-potable system is supplied by ASR 3/3A. Upper elevations at the north end of SCM are too high in elevation to receive adequate service pressure from ASR 3/3A. These SCM areas are currently proposed to be served by PRVs from the potable water system until the CMUP project area non-potable supply is constructed. Once CMUP project area development occurs, service to these upper elevation SCM areas will transition to non-potable supply from the CMUP project area.

Two alternatives are proposed to serve elevations above the existing SCM ASR 3/3A service boundary: Alternative 1 supplies upper elevations from a 750 HGL storage reservoir, Alternative 2 supplies upper elevations directly through ASR wells (see attached **Figures 2A and 2B**).

## **Alternative 1 - 750 HGL Storage Reservoir**

Alternative 1 includes a reservoir with a 750-foot overflow located east of Cooper Mountain Nature Park to serve upper zone non-potable customers. Additional ASR wells will supplement the existing ASR 3/3A (SCM non-potable source) to supply the SCM and CMUP areas with non-potable water. These ASR wells are proposed at CMR 3, the proposed 750 Reservoir site, within the 605 Zone, and west of the Cooper Mountain Nature Park.

Well construction should occur as development warrants, with lower zones (507 and 438) tying into the SCM non-potable system and upper zones primarily served through new ASR wells. The proposed 750 Reservoir will be supplied by a proposed ASR well located at the 750 Reservoir site that first pumps up to the 882 Zone to supply upper residents, then PRV's back down into the tank which can supply all lower zones through PRVs. Alternative connections to the potable system should be made, to maintain supply if non-potable ASR facilities are out of service.

## **Alternative 2 – Booster Pumping**

Alternative 2 uses booster pumping and hydropneumatic tanks to serve non-potable customers. As in Alternative 1, ASR 3/3A will supply the lower three non-potable zones by pumping or PRV (507, 438, and 410 Zones). Additional ASR wells will supplement supply, as development warrants. An ASR well located at CMR 3 is anticipated to serve the 697 zone and PRV down to the 605 zone. A second ASR well potentially located at near CMR 1 and 2 pumping to an HGL of 882 will serve the 882 and 790 zones, once development occurs above the 697 Zone. All non-potable zones would be connected by PRVs. Alternative connections to the potable system should be made, to maintain supply if non-potable ASR facilities are out of service.

## ***Non-Potable System Considerations***

Demand in the non-potable system is almost entirely irrigation. Therefore, hourly peaking factors are likely to be much greater than typically seen in potable water systems. This kind of inconsistent demand throughout the day requires frequent pump starts and stops, which creates more stress and wear on well pumps and motors than continuous operation. A storage reservoir is needed to supply non-potable irrigation demands as wells are ramping up to meet instantaneous peak demand, such as when automatic sprinkler systems start simultaneously for a large number of customers. Even in Alternative 2, hydropneumatic tanks will be required at each non-potable ASR well site to provide this buffer supply. The non-potable system could also be connected via interties with the potable system to augment supply during instantaneous demand peaks. The City will evaluate two alternates: (1) non-potable reservoir and (2) potable to non-potable intertie for short peaking durations needed in the non-potable distribution systems. This intertie would shift demand peaking concerns to the potable system and may require additional infrastructure or operational techniques to manage in the potable system.

## Conclusions and Recommendations

Potable and non-potable supply to the Cooper Mountain area is feasible, although determining specific distribution main alignments and pipe sizing is highly dependent on future development. Backbone piping alternatives for both potable and non-potable systems are aligned with existing pressure zones and facilities. Several key decisions, listed below, are still in progress at the City which will affect both potable and non-potable supply in Cooper Mountain. As these decisions progress, water and non-potable alternatives should be refined.

### *Future Decisions Impacting Cooper Mountain Water and Non-Potable Service*

To provide complete potable and non-potable water alternatives, the following next steps are recommended:

#### **Both**

- Update the potable and non-potable supply alternatives to be consistent with any new refinements in the land use framework from the Community Plan.
- Continued coordination with storm and sewer utility planning.

#### **Potable**

- The following preliminary alignments or sites should be selected:
  - The transmission route from the proposed 550 Zone Pump Station to the 175th Avenue transmission main.
  - The site for the proposed Tile Flat Pump Station for future supply from the WWSS.
  - The site for the proposed CMR 3.
- Continued coordination with Tualatin Valley Water District (TVWD) regarding service to existing TVWD customers in the Cooper Mountain Area. (See existing TVWD service area in **Figure 1.**)

#### **Non-Potable**

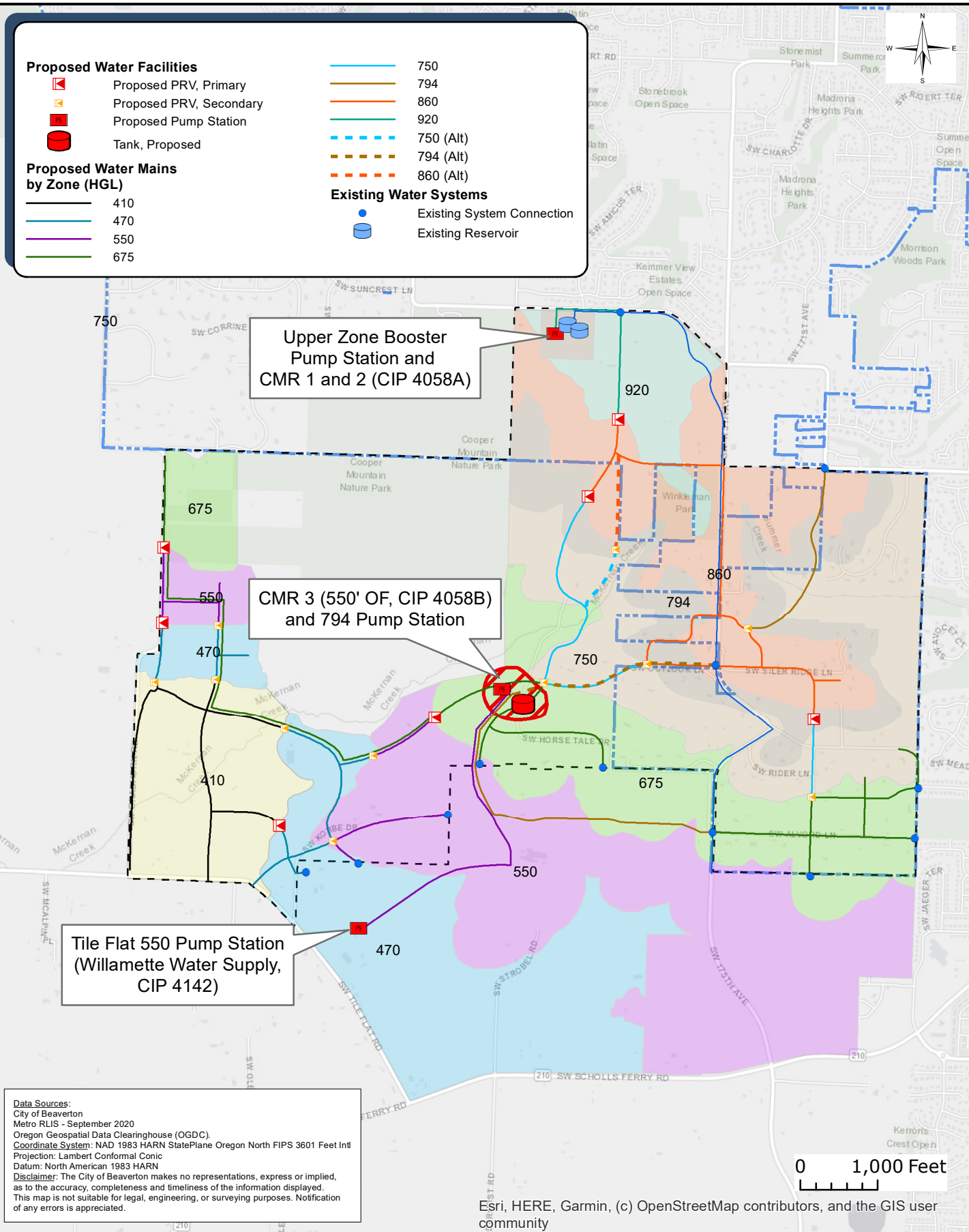
- Address stormwater injection requirements for ASR use as non-potable supply.
- Continue coordination with the non-potable system in South Cooper Mountain.
- Discuss and select siting for additional non-potable and ASR facilities, including potential non-potable 750 HGL storage reservoir, potable system interconnects, etc.

## References

Murraysmith. (2019, January). *Water System Master Plan*.

Murraysmith. (2020, July 15). Cooper Mountain Utility Plan *Vision Statement and Guiding Principles*.





# Cooper Mt. Utility Plan (CMUP)

## Figure 1 Proposed Water System

G:\PDX\_P\Projects\20\2755 - Beaverton Cooper Mt. Utility Plan (CMUP)\GIS\Water and Non Potable\Beaverton\_CMUP\_water\_memo\_20201214.mxd 2/9/2021 10:01:27 AM claire.devos

## Proposed Non Potable Facilities

- ASR Well
- Existing System Connection
- ◀ PRV, Primary
- ◀ PRV, Secondary
- PS Pump Station
- Tank

## Proposed Non-Potable Mains by Zone

- 410
- 438
- 507
- 605
- 697
- 790
- 882
- 882 (Alt)
- 697 (Alt)



Future ASR Well  
(605 HGL)

ASR Well (750 HGL,  
at CMR 3)

750 Reservoir,  
Future ASR Well (882 HGL)

ASR 3/3A  
(507 HGL)

**Data Sources:**  
City of Beaverton  
Metro RLIS - September 2020  
Oregon Geospatial Data Clearinghouse (OGDC)  
**Coordinate System:** NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl  
**Projection:** Lambert Conformal Conic  
**Datum:** North American 1983 HARN  
**Disclaimer:** The City of Beaverton makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.

0 1,000 Feet

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community



## Cooper Mt. Utility Plan (CMUP)

## Figure 2A Proposed Non Potable Water System Alternative 1 (750 Storage)

## Proposed Non Potable Facilities

- ASR Well
- Existing System Connection
- ◀ PRV, Primary
- ◀ PRV, Secondary
- PS Pump Station
- Tank

## Proposed Non-Potable Mains by Zone

- 410
- 438
- 507
- 605
- 697
- 790
- 882
- 882 (Alt)
- 697 (Alt)

Future ASR Well (605 HGL)

ASR Well (697 HGL) at Proposed CMR 3 Site

Future ASR Well (882 HGL) at CMR 1 and 2 Site

ASR 3/3A (507 HGL)

**Data Sources:**  
City of Beaverton  
Metro RLIS - September 2020  
Oregon Geospatial Data Clearinghouse (OGDC)  
**Coordinate System:** NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl  
**Projection:** Lambert Conformal Conic  
**Datum:** North American 1983 HARN  
**Disclaimer:** The City of Beaverton makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.

0 1,000 Feet

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community



## Cooper Mt. Utility Plan (CMUP)

## Figure 2B Proposed Non Potable Water System Alternative 2 (ASR Pumping)